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**North Nashua River  
Flood Control Project  
(Formerly Phillips Lake)  
Massachusetts**

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# **Plan of Study**

**JUNE 1981**



**US Army Corps  
of Engineers**  
New England Division

NORTH NASHUA RIVER  
FLOOD CONTROL PROJECT  
(FORMERLY PHILLIPS LAKE)  
MASSACHUSETTS

PLAN OF STUDY

Department of the Army  
New England Division, Corps of Engineers  
Waltham, Massachusetts 02254

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## PREFACE

The purpose of this Plan of Study is to assess the activities required to reevaluate the feasibility report based on current conditions and criteria. Inasmuch as about 15 years have passed since authorization of the basin plan, initial efforts concentrated on reanalyzing the problems and needs of the study area. In addition, due to local opposition to the authorized plan, considerable effort was directed toward developing and coordinating preliminary alternative solutions. Through this coordination, it was determined that there appear to be alternative solutions that could be implemented by the Corps of Engineers. This report sets forth the work required to complete this reformulation analysis.

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# NORTH NASHUA RIVER FLOOD CONTROL PROJECT

## (FORMERLY PHILLIPS LAKE) MASSACHUSETTS

### PLAN OF STUDY

#### PROJECT AUTHORIZATION DATA

The Phillips Lake, Massachusetts, water resources development project was authorized by Section 203 of the 1966 Flood Control Act (Public Law 89-789, 89th Congress). Information on the authorized project is contained in Senate Document No. 113, 89th Congress, 2nd Session. An EIS was not prepared for the project as it was not a requirement. Funds to initiate Phase I, AE&D study for this project were provided in FY 1978.

#### PROJECT DESCRIPTION

The Phillips Lake project represents one element of an overall water resources development plan authorized for the North Nashua River Basin. The plan included three other reservoirs, namely Whitmanville, Nookagee, and Monoosnoc as well as three local protection projects to meet the flood control, water supply, recreation and associated water resource needs of the basin (see Plate 1).

The Phillips Dam site is located on Phillips Brook in West Fitchburg about 1/2 mile north of its confluence with the North Nashua River. At spillway crest, elevation 675 National Geodetic Vertical Datum (NGVD), the reservoir would have a surface area of about 105 acres and extend approximately 3/4 mile upstream. The reservoir would have a storage capacity of 1,600 acre-feet. The dam with a top elevation of 690 feet NGVD would be of the rolled earthfill type and would have a total length of 1,700 feet (including spillway) and maximum height of 48 feet. A chute spillway with an ogee weir 200 feet long would be founded on rock on the left bank. A concrete inlet structure with an ungated 54-inch opening and an invert elevation of 643 feet NGVD would conduct normal flows through the dam. A portion of Route 12 would also be raised and incorporated into the main dam (see Plate 2). The Phillips dam would act in tandem with the Nookagee project located about two miles upstream, and would control floodflows from Phillips Brook.

#### STATUS OF AUTHORIZED PROJECT

Since authorization of the North Nashua River Basin Plan in 1966, the New England Division has been involved in two distinct activities which relate to the Phillips Dam project but were directed at other elements of the authorized basin plan. The first concerned the rehabilitation of the existing North Nashua River channel through the city of Fitchburg. This rehabilitation work included construction of walls, bank stabilization, slope protection and removal of shoal areas along a 3.5 mile reach of the stream. The rehabilitation, which was completed in September 1980, restored the river's capability to safely convey a flow of 9,000 cfs.

In conjunction with this channel rehabilitation project, the Congress authorized the Whitmanville, Nookagee and Phillips Lake projects. These three upstream reservoirs were needed to provide an optimum flood control solution for Fitchburg because recorded flows in 1936, 1938 and 1955 (9,400, 8,900 and 7,800 cfs, respectively) exceeded or nearly exceeded the capacity of the rehabilitated channel. Two of the three proposed reservoirs are located in Westminster (Whitmanville and Nookagee) and one in Fitchburg (Phillips).

In May 1976, the town of Westminster, by a vote of its Annual Town Meeting and reaffirmed by the Board of Selectmen, went on record as opposing the Whitmanville and Nookagee projects. A revised reservoir plan was developed by deleting the Nookagee project in Westminster and providing as an alternate a larger Phillips Lake project in Fitchburg. Under this plan, the land-taking burden was shifted somewhat to the city of Fitchburg, which is the primary beneficiary of the upstream reservoir flood control proposals.

The revised and enlarged Phillips Lake project generated strong local opposition from a Fitchburg concerned citizens group composed of affected property owners. This group spearheaded a strong opposition campaign that culminated in a Fitchburg City Council vote on 5 July 1977 opposing any further study of the revised Phillips Lake project. In addition and since the revised plan also retained the Whitmanville project, the residents of Westminster reaffirmed their strong opposition to the development of any flood control project within their community by a vote at their annual Town Meeting. Nevertheless, there were areas of local support for some form of flood protection, such as an endorsement by the Fitchburg Chamber of Commerce and an editorial in the Fitchburg-Leominster Sentinel and Enterprise. As a result, funds for a restudy of the Phillips Lake project were included in the fiscal year 1978 appropriations.

Prior to initiation of further review of the North Nashua River Basin Plan, local officials were contacted for their views on the plan considering past events. In this regard, on 21 April 1978 a letter was received from the Mayor of Fitchburg informing the Corps that he supported the channel rehabilitation project now completed, and that he had requested the President of the City Council to form a Citizens' Advisory Committee on flood control. The President of the City Council noted to us in his letter of 12 June 1978 that a committee of citizens had been appointed to advise the Mayor and City Council with regard to flood control along the North Nashua River.

The advisory committee believes that flood protection is necessary, but that any solution should reduce the impact on developed real estate. On this basis a reanalysis of the basin was conducted to include an assessment of current problems and needs, including changed physical and social conditions, and the formulation of potential alternative solutions. A booklet, outlining a preliminary array of structural and nonstructural alternatives, including channel widening, upstream storage (reservoirs), bypass tunnels, floodproofing and various combination plans, was prepared and coordinated with the citizens' committee. Because of Westminster's concerns regarding projects in their town, minimizing or eliminating impacts to this community was of primary concern during development of these alternatives.

Several meetings were held with the Fitchburg Mayor and City Council, and with the Advisory Committees from both Fitchburg and Westminster at which time alternatives were discussed. This public involvement resulted in receipt of a letter of support from the Mayor of Fitchburg, dated 23 December 1980, which expressed his continued interest in activities to prevent or reduce flooding from the North Nashua River.

## PROBLEM IDENTIFICATION

### NATIONAL OBJECTIVES

The planning process followed by the Corps of Engineers in its water resources studies is a systematic approach to analyzing problems and needs, identifying the desired outputs of the study and developing and evaluating alternative resource management plans. This approach is consistent with the Federal guidelines enumerated in the Water Resources Council's Principles and Standards (P&S).

Planning is directed toward achieving National Economic Development (NED) and Environmental Quality (EQ) as equal national objectives. The NED objective is achieved by increasing the value of the Nation's output of goods and services, and improving the national economic efficiency. For this study, potential contributions to the NED objective would be derived from flood damage reduction and enhancement of recreational opportunities. The EQ objective is achieved by the management, conservation, preservation, creation, restoration or improvement of the quality of certain natural and cultural resources and ecological systems. Water quality, fish and wildlife resources, and historic sites are important items which will be addressed under the EQ objective.

### EXISTING CONDITION

#### The Study Area

The North Nashua River Basin is situated in the Montachusett Region of north-central Massachusetts. Fitchburg-Leominster represents the largest urban area in this 18-community region which is one of the 10 Standard Metropolitan Statistical Areas (SMSA) in Massachusetts. Within this SMSA, Fitchburg has the largest population and is a major employment center. The study area is located about 40 miles northwest of Boston and 25 miles north of Worcester.

As previously stated, Phillips Lake was one element of a comprehensive river basin plan, which together with two other reservoirs (Whitmanville and Nookagee) and the now completed channel rehabilitation project would have provided the flood control and other related water resource needs of Fitchburg and the upper North Nashua River Basin. Because the principal flood damage areas to be protected are situated within the city of Fitchburg, alternative plans will concentrate on solving the flood control and related problems within the city of Fitchburg.

### Climate and Precipitation

The basin has a variable climate, and a mean annual temperature of about 48°F. Temperature extremes range from a summertime high of about 100°F to subzero for short periods in the winter. Freezing temperatures may be expected from the latter part of September until late in April. The basin frequently experiences periods of heavy precipitation produced by local thunderstorms and larger weather systems of tropical and extra-tropical origin. It lies in the part of the prevailing "westerlies" which traverse the country in an easterly or northeasterly direction and produce frequent weather changes. The average annual precipitation over the basin is approximately 45 inches, uniformly distributed throughout the year. The annual snowfall averages about 60 inches, and the average water content of the snow cover in early spring often totals four to six inches.

### Stream Characteristics

The North Nashua River is formed at the confluence of the Whitman River and Flagg Brook in the city of Fitchburg at an elevation of 590 feet NGVD. The river follows a generally northeasterly course for about three miles into the center of Fitchburg and then flows generally southeasterly for about 15 miles to its confluence with the Nashua River in the town of Lancaster. The North Nashua River has a total drainage area of 132 square miles and a fall of 360 feet. Within the city of Fitchburg the river has a fall of about 270 feet. The principal tributaries of the North Nashua River are the Whitman River and Flagg, Phillips, Baker and Monoosnoc Brooks.

### Topography and Geology

The North Nashua River and its tributary system are located along the eastern margin of the New England upland in central Massachusetts. This is a region of moderate relief characterized by wide valleys and broad, steep-sided hills, affording a watershed which is highly conducive to rapid runoff. The basin lies within the western highland of Massachusetts, a rough, naturally dissected upland controlled largely by the underlying crystalline bedrocks which outcrop on the upper slopes and top of many of the hills. Remnants of once vast deposits of glacial outwash occupy the bottoms of many of the major valleys. Above the outwash, the slopes are mantled with a variably thick deposit of glacial till. The bedrock of the region consists principally of granite, with localized areas of schist and phyllite, and has an apparent north-south structural trend.

### Population

Of the communities in the immediate vicinity of Fitchburg, only Fitchburg has not shown a population increase from 1970 to 1980. Long considered a blue collar manufacturing city, it may have reached its population saturation point. However, this is a common occurrence in older cities of Massachusetts when people relocate to newer, less crowded and better developed suburbs, but utilize the central cities as a major employment, shopping, education and service center. As shown in Table I, communities

surrounding Fitchburg have experienced significant population growth over the preceding 10-year period. Residents commute within the Fitchburg-Leominster labor area while others travel to other employment areas such as Worcester and Boston.

TABLE 1  
POPULATION CHANGE 1970 - 1980

| <u>Community</u> | <u>1970<br/>Population</u> | <u>1980<br/>Population<sup>1</sup></u> | <u>Percent<br/>Change</u> |
|------------------|----------------------------|--|---------------------------|
| Ashburnham       | 3,480                      | 4,119                                  | + 18.2                    |
| Fitchburg        | 43,343                     | 39,332                                 | - 9.3                     |
| Leominster       | 32,939                     | 34,318                                 | + 4.2                     |
| Lunenburg        | 7,419                      | 8,375                                  | + 12.9                    |
| Westminster      | 4,273                      | 5,125                                  | + 19.9                    |

SOURCE: US Census Figures

<sup>1</sup>Preliminary Figures, 1980 US Census

#### Industry

Fitchburg, an older manufacturing city, has many of its plants located along the North Nashua River. These plants are within easy commuting distance from the downtown area, but there is little room for expansion. Many of these concerns have had a long association with this area, and Fitchburg continues to remain a major manufacturing center for the labor area and the Montachusett region. The labor force for the five communities listed above was 32,132 in 1977 with 50 percent employed in the manufacturing sector of the economy. Approximately 40 percent of that total was employed by manufacturing firms in Fitchburg. Fitchburg is expected to retain its attraction as a major employment center and its manufacturing establishments will have a significant impact on any economic development, or lack of development, that this area experiences. Table 2 describes employment by place of residence and employment sector for Fitchburg and four of its surrounding towns for 1977.

TABLE 2  
EMPLOYMENT BY PLACE OF RESIDENCE  
AND EMPLOYMENT SECTOR - 1977

|  | <u>Ashburnham</u> | <u>Fitchburg</u> | <u>Leominster</u> | <u>Lunenburg</u> | <u>Westminster</u> |
|--|-------------------|------------------|-------------------|------------------|--------------------|
| Wholesale and Retail                       | 115               | 3,782            | 2,988             | 147              | 380                |
| Finance, Insurance and Real Estate         | 10                | 838              | 283               | 15               | 19                 |
| Services                                   | 93                | 3,041            | 1,659             | 167              | 98                 |
| Mining                                     | 0                 | 0                | 0                 | 0                | 0                  |
| Construction                               | 4                 | 443              | 345               | 111              | 45                 |
| Manufacturing                              | 149               | 6,656            | 6,890             | 183              | 2,320              |
| Transportation Communication and Utilities | 15                | 762              | 458               | 45               | 30                 |
| Agricultural Forest and Farm               | <u>1</u>          | <u>11</u>        | <u>15</u>         | <u>18</u>        | <u>0</u>           |
| Total                                      | 387               | 15,531           | 12,638            | 685              | 2,891              |

Source: Massachusetts Department of Employment Security

#### Unemployment

Statistics for February 1981 indicate a labor force of 48,140 for the Fitchburg-Leominster labor area. Of this number, 45,050 people were employed and 3,909 were unemployed, resulting in an unemployment rate of 6.4 percent. The Massachusetts unemployment rate for the same period was 5.8 percent, and the US figure stood at 7.3 percent. The city of Fitchburg for February 1981 had a labor force of 19,960 and unemployment of 1520 for an unemployment rate of 7.1 percent.

#### Income

The income for the Fitchburg area is directly related to the economic well-being of the manufacturing concerns around the city. The average annual income for the above five communities for 1979 was \$10,103. The average annual income for Fitchburg for the same year was \$10,354. Fitchburg has the greatest number of families in the region with incomes below the poverty level.

### Housing

The housing characteristics for Fitchburg and the four surrounding towns are portrayed in Table 3.

TABLE 3

**TOTAL HOUSING UNITS AND  
PERCENT CHANGE FROM 1970 TO 1980**

| <u>Community</u> | <u>Housing<br/>Units, 1970</u> | <u>Housing<br/>Units, 1980</u> | <u>Percent<br/>Change</u> |
|------------------|--------------------------------|--------------------------------|---------------------------|
| Ashburnham       | 1,562                          | 1,850                          | + 18                      |
| Fitchburg        | 14,821                         | 15,368                         | + 4                       |
| Leominster       | 10,375                         | 12,980                         | + 25                      |
| Lunenburg        | 2,532                          | 3,135                          | + 24                      |
| Westminster      | 1,564                          | 1,980                          | + 27                      |

Source: US Census Figures, Housing Units for 1980 are Preliminary US Census Figures.

Housing units have increased in all five communities over the same time period and although Fitchburg experienced a decrease in population from 1970 - 1980, it registered an increase in housing units during this same time span. This was caused principally by an increase in housing for the elderly.<sup>1</sup> In addition, the average household size has decreased nationally from 3.11 persons per housing unit in 1970 to 2.75 in 1980.

### Land Use

Table 4 provides the existing land use characteristics for Fitchburg and four surrounding towns.

<sup>1</sup> City of Fitchburg Planning Coordinator

TABLE 4

EXISTING LAND USE (ACRES)

|               | <u>Ashburnham</u> | <u>Fitchburg</u> | <u>Leominster</u> | <u>Lunenburg</u> | <u>Westminster</u> |
|---------------|-------------------|------------------|-------------------|------------------|--------------------|
| Residential   | 1526.2            | 4076.6           | 4665.6            | 2196.1           | 1512.6             |
| Industrial    | 30                | 248              | 1021.3            | 117.3            | 139.2              |
| Commercial    | 7.3               | 204              | 432               | 92.3             | 7.3                |
| Public        | 15.7              | 175              | 202.1             | 37.3             | 24.2               |
| Agricultural  | 650.1             | 603              | 555.7             | 1790.9           | 1141.3             |
| Vacant        | 22,826            | 12,225           | 11,561            | 12,809           | 19,985             |
| Total Acreage | 25,076            | 17,581           | 18,438            | 17,043           | 28,810             |

SOURCE: Montachusets Regional Planning Commission (MRPC) existing land use map, 1973.  
Vacant land includes vacant urban lands as well as State and Municipal forests.

FUTURE GROWTH AND DEVELOPMENT

Projected population, employment figures and probable land use data are the criteria that will be utilized to assess the future growth and development of the region. Emphasis will be placed on the Fitchburg-Leominster Labor Area, which serves as the center for most of the population and economic activity within the region. Any projected development for the region will certainly impact this vital labor area.

Future Population

The following tabulation shows projected population figures for the Fitchburg-Leominster labor area through the year 2020. This represents approximately 60 percent of the region's total at every interval.

TABLE 5

POPULATION PROJECTIONS

| <u>Labor Area</u>        | <u>1980</u> | <u>1985</u> | <u>1990</u> | <u>2000</u> | <u>2005</u> | <u>2010</u> | <u>2015</u> | <u>2020</u> |
|--------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Fitchburg-<br>Leominster | 115,980     | 123,480     | 131,510     | 145,850     | 151,210     | 157,400     | 162,280     | 167,380     |

Source: MRPC August 1973

### Employment

Employment projections in Table 6 represent manufacturing and nonmanufacturing sectors of the economy in the Fitchburg-Leominster labor area from 1970 to 1990.

TABLE 6

#### EMPLOYMENT PROJECTIONS

| <u>Labor Area</u>    | <u>Manufacturing Employment</u> |             |             | <u>Nonmanufacturing Employment</u> |             |             |
|----------------------|---------------------------------|-------------|-------------|------------------------------------|-------------|-------------|
|                      | <u>1970</u>                     | <u>1980</u> | <u>1990</u> | <u>1970</u>                        | <u>1980</u> | <u>1990</u> |
| Fitchburg-Leominster | 17,988                          | 20,200      | 21,378      | 22,488                             | 25,296      | 26,670      |

Source: MRPC Projection 1973

Statistics prepared by the Massachusetts Division of Employment Security list the Fitchburg-Leominster labor area manufacturing employment in February 1981 at 16,380. This labor force relies heavily upon the manufacturing plants located in Fitchburg and Leominster. For the time period 1970 to 1990, projections indicate that 44 percent of the total work force will be employed in the manufacturing sector of the economy. With a projected increase of 19 percent from 1970 to 1990 the continued operation and success of this economic sector will play a major employment role in both the Fitchburg area and region.

### Land Use

Projections to 1995 indicate that land use will intensify, but the overall pattern will not change appreciably. Table 7 below reveals the percent change from 1970 to 1995 in the various land use categories.

TABLE 7

#### LAND USE

| <u>Labor Area</u>    | <u>Category</u> | <u>1971</u>     | <u>1991</u>     | <u>Percent Change</u> |
|----------------------|-----------------|-----------------|-----------------|-----------------------|
|                      |                 | <u>Land Use</u> | <u>Land Use</u> |                       |
| Fitchburg-Leominster | Residential     | 14,550          | 20,830          | + 43                  |
|                      | Commercial      | 790             | 1,305           | + 65                  |
|                      | Industrial      | 1,580           | 2,340           | + 48                  |
|                      | Agricultural    | 5,270           | 4,020           | - 24                  |
|                      | Public          | 13,290          | 17,950          | + 35                  |
|                      | Vacant          | 73,870          | 59,180          | - 20                  |

Source: MRPC, 1975

## PROBLEMS, NEEDS AND OPPORTUNITIES

Problems, needs and opportunities presented in this section were identified through interaction with the public and other agencies. They are not to be considered all inclusive of the problems, needs and opportunities that exist in the study area as others may emerge as the study progresses.

### Flood Problem

The immediate and critical need of the North Nashua River Basin is to control damaging floods caused by major storms and a combination of heavy rains and snowmelt. In the past 45 years, the basin experienced major floods in 1936, 1938, 1944 and 1955. A brief description of these floods is included in the following paragraphs.

March 1936 - Representing the greatest flood of record, this event resulted from intense rainfall, averaging about 5 inches over the basin, during the period of 16-19 March. The high peak discharge was augmented by snowmelt and an antecedent storm.

September 1938 - This flood resulted from torrential rains that preceded a hurricane that passed up the Connecticut River Valley on 21 September. Rainfall from 20-21 September averaged about 7.5 inches over the basin.

October 1955 - Flooding was produced by heavy precipitation from 14-17 October. At Ashburnham, Massachusetts, situated in the upper basin, a total of 11.96 inches of rainfall was recorded between 6:00 a.m. on 14 October and 6:00 a.m. on 17 October.

June 1944 - This was the fourth largest recorded flood in the basin and resulted from torrential rain on 24 June which fell on ground previously saturated by intermittent showers that began on 17 June.

Of the floods noted, the floods of 1936 and 1938 were the most severe, causing widespread damage to industrial, commercial and residential properties along the North Nashua River and its tributaries. It is estimated that a recurrence of the 1936 flood would cause approximately \$58 million in damages (1976 conditions and January 1981 price levels). Flooding is particularly damaging in heavily urbanized areas adjacent to the North Nashua River in Fitchburg where over 800 acres of intensely developed commercial and industrial land is subject to flooding. The riverfront area is almost completely developed with light and heavy industrial concerns, commercial establishments, public buildings and some residential sections. Flooding in this area is caused by a variety of reasons related to channel capacity. Although the gradient of the river is relatively steep, many of the 31 bridges that cross the river along this reach create flow restrictions. The flooding condition is aggravated further by past encroachment on the channel and eight dams that were constructed across the river. Although this condition was improved somewhat with completion of the channel rehabilitation in 1980, the project was not designed to provide complete protection for Fitchburg. Recorded flows in 1936,

1938 and 1955 have exceeded or nearly exceeded the capacity of the rehabilitated channel. It was for this reason that three upstream reservoirs were authorized by the Congress in 1966 to supplement this channel project and provide protection to other areas along the North Nashua River. With withdrawal of support for these projects, additional improvements are needed to provide an optimum flood control solution.

### Water Quality

Although the water entering from its tributaries is of good quality, the North Nashua River has had a reputation for being one of the most polluted rivers in Massachusetts. The condition of the river has improved in recent years with the construction of wastewater treatment plants as well as stricter regulations on those industries that formerly discharged untreated waste into the river. However, combined sewer overflows, dry weather illegal sewage discharges, landfill leachate, urban stormwater runoff and large amounts of organic matter still enter the river. As a result, the river exhibits high levels of coliform bacteria, low levels of dissolved oxygen, high concentrations of ammonia-nitrogen, heavy metals, and grease and oil. The river also has low pH levels and high temperatures, but these may be due to natural conditions. The city of Fitchburg, utilizing funds provided under Section 201 of the Federal Water Pollution Control Act, as amended in 1977, is presently evaluating the water quality problem along the North Nashua River in Fitchburg.

### Recreation

Comprehensive open space planning by communities in the North Nashua River Basin is being coordinated with the Nashua River Watershed Association. Their planning report, completed in 1972, outlines a goal of developing a greenway along both banks of the Nashua River to be accomplished through land acquisition, easements, and flood plain zoning. The plan also advocates urban riverside improvements through creation of public access points, miniparks, greenway paths and other riverfront beautification.

Recreation interests and needs for the North Nashua watershed, which include parts of State Region IV (Montachusets), were identified in the 1978 Massachusetts Statewide Comprehensive Outdoor Recreation Plan. Within this State Region, use of camping, fishing, picnicking and "nonpool" swimming areas by local residents ranks among the highest of any planning region in the state. The referenced report also cites that the primary needs of the region are the preservation of unique ecological sites, preservation and acquisition of open space, and improvement of access to rivers for passive recreation.

The city of Fitchburg has plans to redevelop riverside properties along the North Nashua River in Fitchburg. A subcommittee of the Fitchburg Conservation Commission recently completed a report entitled "Riverside Revitalization" which outlines the city's plans for long range recreation, conservation and redevelopment. Plans focus on the river area from the Daniels Street bridge downstream to the Bemis Dam. The recreation component of this plan includes a series of small riverside parks, interconnecting trails, and conservation easements or land acquisition to

preserve riverbank vegetation. Several elements of this plan were completed as part of the Corps' rehabilitation project for the North Nashua River channel. The rehabilitation project included provisions for access to the proposed riverside trail system at the River Street bridge, as well as riverbank replanting and aesthetic improvements at several locations.

#### Fish and Wildlife Resources

Although the North Nashua River has been degraded by pollution and urban development for many years, coordination with the Fish and Wildlife Service has determined that the river still has a potential as aquatic habitat. Recent construction of treatment plants has improved water quality and resulted in the return of some warmwater fish species such as yellow perch and common sucker. There is songbird habitat in pockets of trees and shrubs along the riverbanks. Such areas are not extensive in the city but increase in upstream and downstream locations where they support some small mammals. The river also provides resting and feeding areas for waterfowl, some of which are situated within the city of Fitchburg.

#### Water Supply

Of the three reservoirs authorized in the North Nashua River Basin Plan, two (Whitmanville and Nookagee) included facilities for industrial water supply. However, on 9 September 1969, local interests, acting through the Mayor of Fitchburg, withdrew their support for the water supply purpose at both dams.

### PROBLEM AND OPPORTUNITY STATEMENTS

The 1965 authorizing document for the North Nashua River Basin Plan provided the basis for identification of the problems and opportunities in the study area. Identified needs in this report were modified based on an assessment of current conditions and coordination with local interests and other agencies. The resulting statements of the desired outputs of the study will be used as a guide in the formulation of alternatives, assessment of impacts and evaluation of each plan. Problem and opportunity statements for the 1980-2080 period of analysis are as follows:

- a. Reduce future inundation damages, particularly within the city of Fitchburg, caused by flooding along the North Nashua River and its tributaries.
- b. Enhance, where possible, water quality for aesthetic and recreation purposes in the North Nashua River.
- c. Provide, where possible, additional contributions to the area's water-based recreation needs along the North Nashua River.
- d. Assist in the preservation and enhancement of historic resources and fish and wildlife habitat in the study area.

The statements listed above will be continuously reanalyzed and modified as the study progresses to reflect additional information and any new concerns that may surface.

### PLAN FORMULATION

The previous section on Problem Identification discussed the problems and needs of the study area and developed the problem and opportunity statements for the study. To address these desired outputs or goals, a broad range of management measures have been identified. These measures will be screened to determine their applicability to the study area. The study will refer to earlier reports and findings, and will be coordinated with the efforts of others.

### MANAGEMENT MEASURES

#### Flood Damage Reduction

Measures that address the primary goal of flood damage reduction fall into two categories: structural and nonstructural. Structural measures are those that modify flooding, while nonstructural plans modify the susceptibility and impact of flooding. The two general categories of flood protection measures, along with more detailed alternative approaches, are shown on Table 8. These alternative measures may be applied individually or in combination with others to produce an effective flood prevention plan.

**TABLE 8**

**ALTERNATIVE FLOOD PROTECTION MEASURES**

**I. Measures to Modify floods**

**A. Modify Floods Prior to Reaching Critical Damage Area**

1. Reservoirs
2. Bypasses
3. Land Treatment

**B. Modify Floods at Critical Damage Area**

1. Dike/Floodwall Construction
2. Channel Modification
3. Preflood Emergency Flood Fighting

**II. Measures to Modify Damage Susceptibility**

**A. Modify (Prevent) Actual Damages**

1. Floodproofing
2. Relocation
3. Land Use Regulations and Zoning

**B. Modify Individual Economic Losses While Permitting Major Damages**

1. Flood Insurance
2. Flood Warning and Emergency Evacuation
3. Emergency Assistance

### Water Quality

The quality of water in the North Nashua River has improved considerably because of Federal and State programs which resulted in the construction of several wastewater treatment plants. In addition to these efforts, the Montachusett Regional Planning Commission (MRPC) has recommended additional improvements as part of their Section 208 Water Quality Management Plan. These are:

- . Change zoning to eliminate land use--water quality conflicts
- . Promulgate septic system and septage disposal management
- . Upgrade municipal landfill operations
- . Relocate municipal landfill
- . Establish shoreline greenways
- . Develop management program for town lakes
- . Provide for disposal of wastewater treatment plant sludge
- . Control agricultural runoff
- . Control erosion and sedimentation from construction activities

In addition to the recommendations of the MRPC, the city of Fitchburg is presently utilizing funds provided under Section 201 to evaluate alternative solutions to the water quality problem along the North Nashua River in Fitchburg. As their study progresses, close coordination will be maintained with the city. Areas of water quality improvement which this study could most likely have a beneficial impact are land use control, establishment of shoreline greenways, and erosion and sedimentation control.

### Recreation, and Fish and Wildlife

Improvements to the water quality of the North Nashua River have enhanced recreation opportunities and fish and wildlife habitat along the river. Recognizing the increased importance of the river, the city of Fitchburg has begun to implement a "Riverside Revitalization Plan." The primary elements of this plan, which was developed by the Nashua River Watershed Association and the Fitchburg Conservation Commission, are shown below.

- . Encourage preservation of open space along the river corridor.
- . Develop riverwalks, parks and historic districts along the river.
- . Improve aesthetics and reduce erosion with plantings or other improvements.

In conjunction with any considered flood control improvements, efforts will be made to expand opportunities for recreation and enhance the fish and wildlife resources of the area under study.

## PLAN FORMULATION RATIONALE

The plan formulation process provides for the development and evaluation of those management measures described, some of which have been accomplished in various degrees or are planned for in the future by non-Federal entities. All potential management measures will be evaluated for their ability to achieve the goals of the study. If found appropriate, they are applied either singly or in combination to address the area's needs.

## DEVELOPMENT OF ALTERNATIVE PLANS

Of the plans investigated during Stage 1 of the study, several appear to be economically justified and/or locally acceptable based upon preliminary coordination and analysis of existing conditions. The few preliminary plans presented in the following paragraphs do not represent the full range of management measures that will be evaluated as the study progresses. Because these solutions to the flood problem appear to warrant further Federal involvement, they are presented only to provide the basis for continuation of the study.

### Upstream Reservoirs

Although several reservoir schemes will be investigated in Stage 2, the one presented here is the three reservoir system authorized by the 1966 Flood Control Act. This system, shown on Plate 1, would consist of the Whitmanville, Nookagee and Phillips dams. Located on tributaries of the North Nashua River, these reservoirs would provide a high degree of flood protection to the city of Fitchburg. The plan has a total estimated first cost of \$43.9 million (October 1980 price levels) and a benefit-to-cost ratio of 1.4 to 1.0. Although this plan is not locally acceptable at this time, it remains as an economically justified solution to the flood problem.

### Bypass Tunnels

Due to the extensive development that exists along both banks of the North Nashua River, several bypass tunnels are being considered. Of the alignments under study, bypass tunnel Plan C received the most support during preliminary coordination with local interests. This underground tunnel, with appropriate inlet and outlet structures, would bypass flows around heavily developed sections of Fitchburg. The tunnel would be about 18,000 feet in length, 22.5 feet in diameter and would have a capacity of 11,500 cubic feet per second (cfs). The combined capacity of the tunnel and the rehabilitated North Nashua River channel would provide protection against the Standard Project Flood (SPF) which has a peak flow of 20,000 cfs. The total estimated first cost of this plan is \$45 million (October 1980 price levels) and preliminary economic analysis indicates a benefit-to-cost ratio of 1.3 to 1.0. Further study of this plan is supported by local interests as it solves the flood problem with a minimum of impacts on developed real estate.

### Nonstructural Plans

Several nonstructural solutions, measures that modify damage susceptibility, have been investigated and coordinated during the initial stage of the study. Measures that appear to be applicable in Fitchburg include floodproofing, flood warning and evacuation, and flood insurance. Although all measures will be investigated at a greater level of detail, local interests, particularly local businessmen, indicated the greatest support for a flood warning and emergency evacuation plan. They felt that sufficient warning time would allow them to minimize their losses as some equipment and other contents could be relocated. Preliminary analysis of the North Nashua River Basin upstream of the primary damage areas determined that an automated flood forecast and warning system could be installed at a relatively low cost, approximately \$100,000. Although the majority of flood losses would still occur with this plan, experience in similar areas indicates that losses prevented would be more than sufficient to justify this cost.

### COMPARATIVE ASSESSMENT AND EVALUATION

Detailed evaluations to determine specific economic and engineering feasibility and environmental impacts of alternative measures will be accomplished in the next stage of the study.

Three reservoirs and a channel rehabilitation project were authorized by the Congress in 1965 to reduce flooding. However, since that time changed social and physical conditions have made the construction of reservoirs unacceptable. The proposed reservoirs would have been situated in Fitchburg and Westminster, but both communities have opposed their construction. The city of Fitchburg, however, has indicated strong support for additional flood protection but desires to minimize land taking requirements and impacts to developed real estate. Of the management measures currently under study, constructing a tunnel to bypass heavily developed portions of downtown Fitchburg shows considerable promise. Detailed studies will be required to properly evaluate this and other potential solutions.

### CLASSIFICATION OF PHASE I STUDY

Because of the expressed desire of local interests to develop alternative solutions to the authorized flood control plan the Division Engineer sees sufficient reason to reclassify the Phase I A E & D Study to a Reformulation A E & D Study.

### DISCUSSION OF OBJECTIVES AND MILESTONES

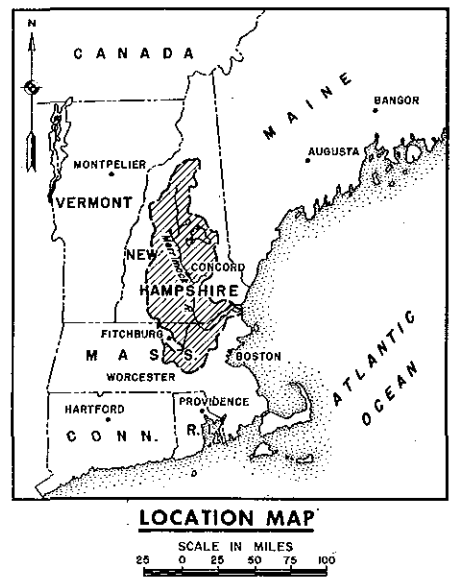
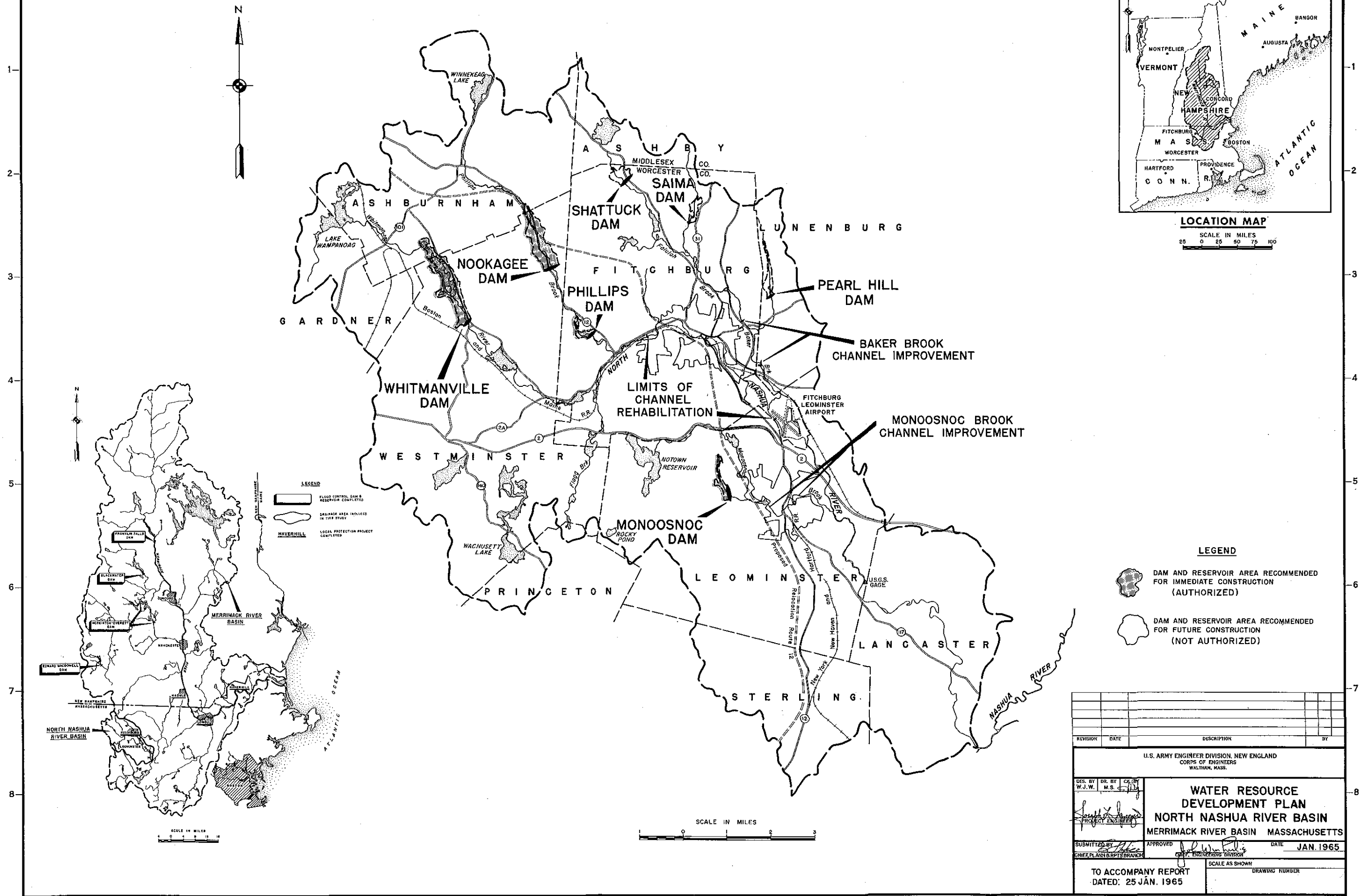
Specific alternatives to satisfy the needs of the area will be developed during Stage 2 of the study. The likely economic, social and environmental impacts of these plans will be identified and those lacking public support will be eliminated from consideration. Investigations will develop a range of alternative plans that are economically justified and locally acceptable. Such

plans will form the basis for Stage 3 of the study which emphasizes the detailed assessment and evaluation of acceptable alternatives and selection of the plan that is in the best public interest. Assuming the selected plan can be implemented by the Federal government, the plan will be refined and a final report and Environmental Impact Statement (EIS) prepared to support Congressional authorization.

It is estimated that for submission of Stage 2 Documentation for the Stage 2 Checkpoint Conference (Milestone 24) will be January 1982. The estimated date for submission of the final Phase I GDM and EIS (Milestone 31) is September 1983. Study Schedule Milestones and a Work Sequence Diagram are shown in Inclosure 4.

### RECOMMENDATIONS

The Division Engineer recommends approval of this Plan of Study to reclassify the Phillips Lake Phase I A E & D Study to a Reformulation Study and to commence activities as noted in Inclosure 4. The next stages of the study will examine the **feasibility of providing improvements for flood control** and allied purposes in the North Nashua River Basin, specifically within the city of Fitchburg, Massachusetts.



**LEGEND**

- DAM AND RESERVOIR AREA RECOMMENDED FOR IMMEDIATE CONSTRUCTION (AUTHORIZED)
- DAM AND RESERVOIR AREA RECOMMENDED FOR FUTURE CONSTRUCTION (NOT AUTHORIZED)

| REVISION | DATE | DESCRIPTION | BY |
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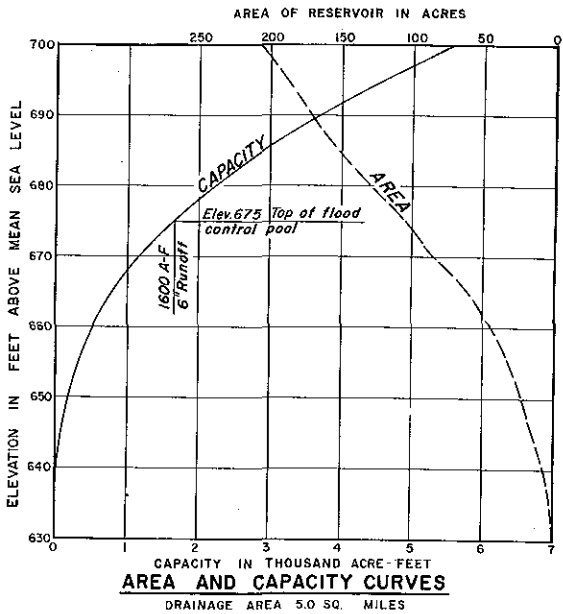
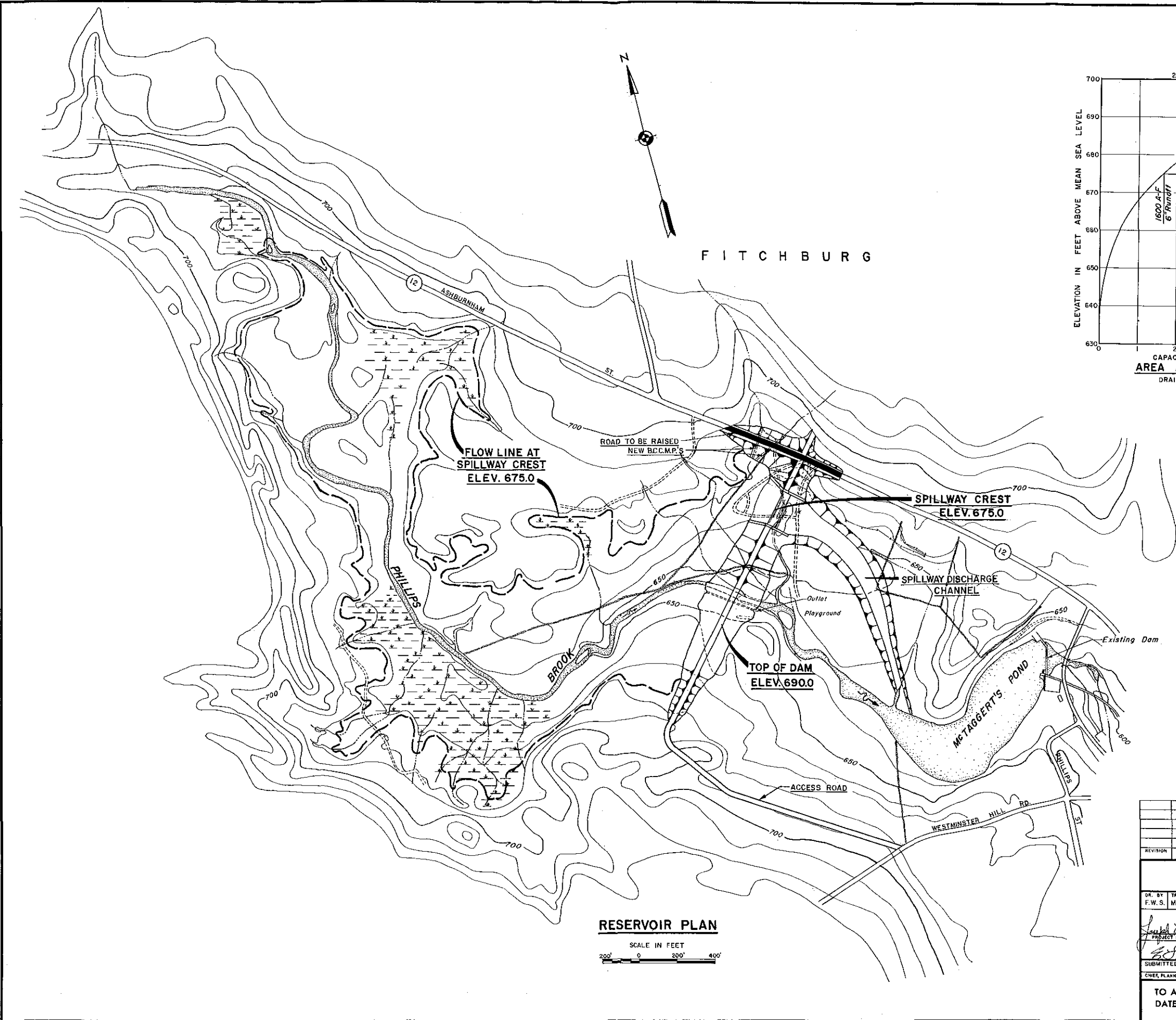
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND  
CORPS OF ENGINEERS  
WALTHAM, MASS.

DES. BY: W.J.W. DR. BY: M.S. CK. BY: [Signature]  
PROJECT ENGINEER: [Signature]

SUBMITTED BY: [Signature] APPROVED: [Signature] DATE: JAN. 1965  
CHIEF PLANNING & REPORTING DIVISION: [Signature] CHIEF ENGINEERING DIVISION: [Signature]

TO ACCOMPANY REPORT  
DATED: 25 JAN. 1965

SCALE AS SHOWN  
DRAWING NUMBER



NOTES:

Elevations refer to Mean Sea Level Datum.  
Contour intervals equal ten feet.  
Topography is based on Dec. 1936 & Jan. 1937  
survey by U. S. Army Corps of Engineers and on  
U. S. G. S. Quadrangle Sheet

| REVISION | DATE | DESCRIPTION | BY |
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U. S. ARMY ENGINEER DIVISION, NEW ENGLAND  
CORPS OF ENGINEERS  
WALTHAM, MASS.

DR. BY TR. BY CP. BY  
F.W.S. M.W.B. L.H.G.

PROJECT ENGINEER

PHILLIPS DAM  
NORTH NASHUA RIVER  
RESERVOIR MAP  
MASS.

PHILLIPS BROOK

SUBMITTED BY APPROVED DATE JAN. 1965

CHEK PLANS BRANCH CHIEF ENGINEERING DIV.

TO ACCOMPANY REPORT  
DATED: 25 JAN. 1965

SCALE: AS SHOWN

DRAWING NUMBER

SHEET

**INCLOSURE 1**

**PUBLIC INVOLVEMENT PROGRAM**

## PUBLIC INVOLVEMENT PROGRAM

### OBJECTIVES

The "public," as referenced in this report, is any non-Corps of Engineers entity. This includes other Federal, regional, state and local government entities and officials; public and private organizations; and concerned individuals. The public involvement program will actively involve the public in the study so as to respond to their needs and preferences. A continuous two-way communication will be maintained between interested elements of the public and those conducting the study. The program will be supported by distributing brochures, information sheets and reports; conducting workshop discussions to dispense information and determine public desires; and making press releases to publicize events and information.

### STAGE 1 - PUBLIC INVOLVEMENT

Public participation in the Phillips Lake Phase I AE & D study began with a meeting with the Mayor of Fitchburg in 1978. Because of past opposition to reservoir proposals, the mayor asked the City Council to form a Citizen's Advisory Committee on flood control. This committee has voiced support for a solution to the flood control problem, but a desire to minimize its impact on land taking. Based on these meetings it was determined that a reanalysis of the basin problem should be conducted to include an assessment and reformulation of alternative solutions.

The Westminster Board of Selectmen have stated their opposition to prior reservoir proposals, and have formed an advisory committee to work with the Corps in developing and evaluating alternatives. A preliminary array of potential alternative solutions, reflecting events that have occurred in the past and current needs, has been developed. Reformulated alternatives have been presented and discussed at several meetings with the Fitchburg Mayor and City Council and the Fitchburg and Westminster advisory committees. This coordination has culminated in the receipt of a letter from the Mayor of Fitchburg expressing his continued interest in activities to prevent or reduce flooding from the North Nashua River.

### STAGE 2 - PUBLIC INVOLVEMENT

During this stage the Corps will continue to meet with advisory committees and interested officials and individuals on a regular basis to discuss study progress and exchange information and ideas. This will be accomplished through press releases, written reports, workshops and other meetings, and a formal public meeting to be held in the study area. Public involvement activities will concentrate on identifying the broad range of potential impacts associated with each alternative plan. Public response to alternative plans, as well as economic, environmental and other impacts, will be used to select those plans warranting detailed studies.

### STAGE 3 - PUBLIC INVOLVEMENT

Public involvement activities in Stage 3 will concentrate on impact assessment and evaluation, and trade-off analyses. The trade-offs will involve subjective judgments and must, therefore, reflect public preferences. Whenever necessary, areas of conflict will be resolved by changing alternative plans or through other mitigation measures. The final plan selection will be made in the public interest based on data evaluation and the public involvement process.

INCLOSURE 2

PERTINENT CORRESPONDENCE



CITY HALL  
FITCHBURG, MA. 01420  
(617) 343-4821

# CITY OF FITCHBURG, MASSACHUSETTS

*Executive Department*

DAVID M. GILMARTIN  
Mayor

ROBERT J. HENAULT, JR.  
ADMINISTRATIVE ASSISTANT

April 21, 1978

Col: John P. Chandler  
Corps. of Engineers  
424 Trapello Road  
Waltham, MA 02154

Dear Col. Chandler:

Please be advised that this office supports any channel restoration work to be done on the Nashua River. Also please be advised that I have taken the following additional steps.

- 1) I have asked the President of the City Council to form a Citizen Advisory Group on flood control.
- 2) I have also asked the Congress through Representative Drinan to appropriate money for the purpose of channel restoration.

I will advise you of further developments.

Respectfully,

A handwritten signature in dark ink, appearing to read "D. M. Gilmartin", is written over the typed name.

David M. Gilmartin  
Mayor

DMG:dmr



# City of Fitchburg

Massachusetts 01420

**BERNARD F. CHARTRAND**  
President, City Council

**Board of City Council**

## COUNCILLORS AT LARGE

Joseph Albert  
Harold Gabriel  
Emile J. Goguen  
Mary M. Mayne  
Armand Bucky Richard

## WARD COUNCILLORS

Ward 1 Ronald B. Ingemie  
Ward 2 Henry P. Dextraze  
Ward 3 Herbey J. Vaillancourt  
Ward 4 Jeffrey A. Bean  
Ward 5 Bernard F. Chartrand  
Ward 6 John J. Naylor

June 12, 1978


Mr. Joseph Costanza  
Department of the Army  
New England Division  
Corps of Engineers  
424 Trapelo Road  
Waltham, Massachusetts 02154

Dear Joe

This is to inform you that the Fitchburg City Council President has appointed a committee of citizens in the City of Fitchburg to investigate and advise the Honorable Mayor and City Council with regard to flood control on the north Nashua River.

At the present time it is the intention of this committee to request a continuation of the investigation of the Phillips Dam area in Fitchburg with the understanding that there is no authorization being given or granted for any work other than the engineering study. Until a final vote is taken by the Council, I am not authorized to grant permission for anything more.

Very truly yours

  
Bernard F. Chartrand  
President, City Council

P.S. Enclosed please find a list of members of the above-mentioned committee.

BFC:s



**BERNARD F. CHARTRAND**  
President, City Council

# City of Fitchburg

**Massachusetts 01420**

**Board of City Council**

## COUNCILLORS AT LARGE

Joseph Albert  
Harold Gabriel  
Emile J. Goguen  
Mary M. Mayne  
Armand Bucky Richard

## WARD COUNCILLORS

Ward 1 Ronald B. Ingemie  
Ward 2 Henry P. Dextraze  
Ward 3 Herbey J. Vaillancourt  
Ward 4 Jeffrey A. Bean  
Ward 5 Bernard F. Chartrand  
Ward 6 John J. Naylor

## CITIZENS' ADVISORY COMMITTEE ON FLOOD CONTROL

George Minkkinen (Chairman)  
660 Ashburnham St.  
Fitchburg, Mass. 01420

Mr. Donald M. Crocker  
33 Haskell St.  
Fitchburg, Mass. 01420

John F. Keena, Jr.  
36 Church St.  
Westminster, Mass. 01473

Mr. Harold J. Kelley, Jr.  
875 John Fitch Highway  
Fitchburg, Mass. 01420

Mr. Carey D. Rhoten  
Northfield Rd.  
Lunenburg, Mass. 01462

Mr. James Swiatocha  
199 East St.  
Fitchburg, Mass. 01420

Mr. William Bailey  
545 Ashburnham St.  
Fitchburg, Mass. 01420



# TOWN OF WESTMINSTER

MASSACHUSETTS 01473

FROM THE OFFICE OF THE

**TOWN CO-ORDINATOR**

November 22, 1978

John P. Chandler  
Colonel, Corp. of Engineers  
424 Trapelo Road  
Waltham, MA 02154

Dear Colonel Chandler:

I wish to submit to you the names of the following citizens that were appointed by the Board of Selectmen to act as a Citizens Advisory Committee on Flood Control.

|                      |                          |             |
|----------------------|--------------------------|-------------|
| Mrs. Joan McCall     | 22 Newcomb Rd.           | Westminster |
| Mrs. Dolly Dawley    | 3 Leominster St.         | Westminster |
| Mrs. Elizabeth Aveni | 64 Main St.              | Westminster |
| Mr. Edgar Lavoie     | 276 North Common Rd.     | Westminster |
| Mr. George Wallin    | 375 South Ashburnham Rd. | Westminster |

These citizens have been appointed to Investigate and Advise the Selectmen with regards to Flood Control on the North Nashua River.

Very truly yours,

Daniel J. O'Hearn  
Town Coordinator

cc: Cong. Drinan  
Board of Selectmen



## TOWN OF WESTMINSTER

MASSACHUSETTS 01473

FROM THE OFFICE OF THE

**TOWN CO-ORDINATOR**

March 23, 1979

Joseph L. Ignazio  
Chief Planning Director  
Army Corp of Engineers  
424 Trapelo Road  
Waltham, MA 02154

Dear Mr. Ignazio:

I would like to request that any correspondence concerning the proposed Restudy of the North Nashua River Basin, be mailed to Mrs. Dolly Dawley, 3 Leominster Street, Westminster, who is the Chairman of the Citizens Advisory Committee appointed by the Board of Selectmen. Mrs. Joan McCall, Newcombe Road, is the secretary of the Committee.

If you have any questions please feel free to contact this office at anytime, 874-2181.

Very truly yours,

Daniel J. O'Hearn  
Town Coordinator

DJO/bm



# TOWN OF WESTMINSTER

MASSACHUSETTS 01473

FROM THE OFFICE OF THE

## BOARD OF SELECTMEN

May 29, 1979

By unanimous vote of the Annual Town Meeting on May 5, 1979, Westminster voters once again recorded their unalterable opposition to the establishment of the Whitmanville and Nookagee Flood Control Dams in the Town of Westminster.

Though the concept of flood control for the North Nashua River is recognized, the concept of dams for this purpose has long been argued.

To reiterate the Towns' position regarding the so-called "E-Q" plan, it is our firm stand that when the channel rehabilitation project is completed, there will be no need for the proposed dams.

Therefore, we ask for definite abandonment of the proposed project or any proposal which includes the construction of a dam within the Town of Westminster.

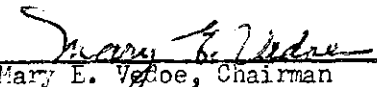
Thank you for your attention and consideration of this matter.

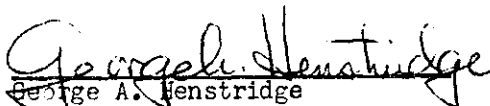
Very truly yours,

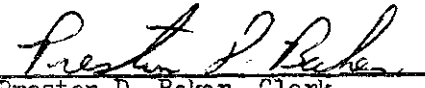
Board of Selectmen

/cac

copies: Senator Kennedy  
Senator Tsongas  
Cong. Drinan  
Governor King  
Senator Hall  
Rep. Harrington

  
Mary E. Veehoe, Chairman

  
George A. Henstridge

  
Preston D. Baker, Clerk



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE  
ECOLOGICAL SERVICES  
P.O. Box 1518  
Concord, New Hampshire 03301

JUL 08 1980

Colonel William E. Hodgson  
Deputy Division Engineer  
New England Division, Corps of Engineers  
424 Trapelo Road  
Waltham, Massachusetts 02154

Dear Colonel Hodgson:

This is our fish and wildlife report concerning your study of flood control measures for the North Branch of the Nashua River at Fitchburg, Massachusetts. Only the proposal to construct a flood diversion tunnel and the several alternate features are discussed, based on advice from your staff that recommendation of a flood control dam on Phillips Brook is remote. We will prepare a supplemental report if a dam is reconsidered.

The original flood control plan was authorized by the Flood Control Act of 1966. Construction of three reservoirs--Whitmanville Lake, Nookagee Lake, and Phillips Lake--was proposed with channel rehabilitation through Fitchburg. We have prepared a number of reports on previous proposals including the North Nashua River Basin Study, the channel rehabilitation study, and five flood control reservoirs. The channel rehabilitation work is almost completed.

Flood control plans have been modified with the addition of tunnel construction. The array of possible alternates now being considered consist of plans for two large or several small flood control reservoirs; five different plans for a 22-foot diameter flood bypass tunnel, and five plans for an 18-foot diameter tunnel in combination with Phillips Brook Reservoir, plans for increasing the channel through Fitchburg and several non-structural plans.

We favor the non-structural plans because their implementation could eventually result in at least partial clearing of the flood plain and preventing further development. Open space could then be created along the river which would be an asset to the city and contribute to the Nashua River Watershed Association's plans for a greenway along the river.

The river still has a potential as aquatic habitat even though it has been degraded by pollution and urban development for many years. Recent improvement in water quality through construction of treatment plants and elimination of waste disposal from paper mills has resulted in return of some warm-water fish species such as yellow perch and common sucker. There is songbird habitat in pockets of trees and shrubs along the river banks. These areas are not extensive in the city but increase upstream and downstream where they support some small mammals.

We believe that construction of the tunnel will be the most environmentally sound plan of all the structural plans considered. Tunnel Plan C calls for a 22-foot diameter tunnel 18,000 feet long. Diversion of floodwater into the tunnel would start when flow reaches 9,000 cfs. All normal flows would remain in the river. A flood event of 9,000 cfs is of significant magnitude because the drainage area of 64 square miles (at the USGS gage) is relatively small. Some bank protection measures will be constructed at the outlet to eliminate erosion when floods are diverted. Construction of this bank protection and the tunnel inlet and outlet is not expected to damage much habitat.

The tunnel has two potential adverse impacts that can be readily identified. Water remaining in the tunnel between floods could become deoxygenated and stagnant. Diversion of water during a flood could force stagnant water into the stream resulting in loss of aquatic organisms. If this proves to be a problem, an aeration device may be necessary to restore dissolved oxygen. We will be concerned if diversion of stream flow is considered for this purpose. Fish could be swept through the tunnel during floods. However, it would be used at infrequent intervals and we believe that loss of fish will not be significant.

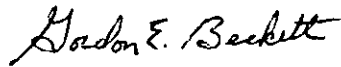
Disposal of spoil from tunnel construction could adversely impact fish and/or wildlife resources if habitat areas are selected for disposal. Please advise us when plans for disposal are being prepared.

Construction of reservoirs and improved channels, instead of or in addition to a tunnel, would have greater adverse impacts upon fish and wildlife resources. Stream channelization has well known adverse impacts. It results in reduction of numbers of species; number of individuals; and growth rate of benthic organisms and fish. There is usually little chance to mitigate or replace these losses. The natural environment of the stream is lost and permanently replaced with an artificial, non-productive environment. Reservoir construction also has specific adverse impacts upon fish and wildlife resources. These can range from permanent loss of terrestrial and stream habitat when dams are constructed to impound permanent pools to temporary losses when flood waters are stored in dry bed reservoirs. Stream habitat in the reservoir area and downstream is damaged by flow changes and siltation. Dams can block movement of resident fish species.

We conclude that construction of the bypass tunnel will result in fewer environmental problems than any other plan considered and we believe that it is the best plan, if construction measures are necessary.

We recommend that measures be taken to relieve any serious stagnation problems in water released from the tunnel. Please advise us when final plans are being made so that we will have the opportunity to report on disposal of spoil and other design features. We also will report on Phillips Lake dam if it receives further consideration. .

Sincerely yours,

A handwritten signature in cursive script that reads "Gordon E. Beckett".

Gordon E. Beckett  
Supervisor



# CITY OF FITCHBURG, MASSACHUSETTS

*Executive Department*

DAVID M. GILMARTIN  
Mayor

CITY HALL  
FITCHBURG, MA. 01420  
(617) 343-4821

ROBERT J. HENAUPT, JR.  
ADMINISTRATIVE ASSISTANT

December 23, 1980

Mr. William E. Hodgson, Jr.  
Acting Division Engineer  
424 Trapelo Road  
Waltham, Ma. 02154


Dear Sir;

This is to inform you that the City of Fitchburg is still interested in flood control activities along the North Branch of the Nashua River.

As a result of work done between your agency and the City, I have been informed that this work would not require financial commitments from the City at this time.

We look forward to co-operating with you in this matter.

Respectfully,

  
David M. Gilmartin  
Mayor

DMG:jem

**INCLOSURE 3**

**ISSUES IDENTIFIED IN COORDINATION  
OF PROJECT DOCUMENT (SURVEY REPORT)**

ISSUES IDENTIFIED IN COORDINATION OF PROJECT DOCUMENT

| <u>DESCRIPTION OF ISSUE</u>  | <u>ISSUE RAISED BY</u>  | <u>PHASE I STUDY RESPONSE</u>   |
|--|---|---|
| Storage for water quality control along North Nashua River should be studied.  | Department of Health, Education and Welfare<br>January 25, 1966 | Water quality problems along the North Nashua River will be considered.                                     |
| Federal-aid highway funds may not be used to finance bridge reconstruction made necessary by channel improvement projects.   | Department of Commerce<br>December 23, 1965                     | Sponsors will be advised of this limitation on funds.   |
| Questioned local participation requirements.   | Department of Agriculture<br>March 23, 1966                     | Current laws concerning local participation in projects will be specified in Phase I report.                |
| Reply to Department of Agriculture concerning local participation.   | Office of the Chief of Engineers<br>11 April 1966               | Recommendations will be in accordance with current legislation and policy.                                  |
| Suggested separating costs of fish and wildlife enhancement. Preservation of archeological resources.  | Department of Interior<br>September 1, 1965                     | Current regulations concerning cost allocation and preservation of archeological resources will be applied. |
| In its judgement practically all flood control benefits for reservoirs accrue to a specifically identifiable group of beneficiaries. Consequently, it recommended that local interests furnish lands, easements and rights-of-way related to flood control features at reservoirs. Subject to above, no objection to submission of report to Congress; however, no committment for appropriations can be made. | Bureau of the Budget<br>October 3, 1966                         | Current laws concerning local cooperation will be applied.  |

| <u>DESCRIPTION OF ISSUE</u>   | <u>ISSUE RAISED BY</u>                   | <u>PHASE I STUDY RESPONSE</u>   |
|---|--|---|
| Transmission of favorable report.<br>Will consider Bureau of the Budget's recommendation concerning local participation requirements. | Secretary of the Army<br>October 5, 1966 | Items of local cooperation will be reanalyzed and any project recommendations will be in accordance with current laws and policies. |

INCLOSURE 4  
SCHEDULE OF WORK AND BUDGETARY DATA

EXHIBITS

| <u>Number</u> | <u>Subject</u>                                       | <u>Page</u> |
|---------------|--|-------------|
| 1             | Estimated Phase I AE&D Work Effort Summary           | 4-1         |
| 2             | Discussion and Justification of Phase I<br>AE&D Work | 4-2         |
| 3             | Copy of Current AE&D Project Justification<br>Sheet  | 4-3         |
| 4             | PB-2b  | 4-7         |
| 5             | Study Schedule Milestones                            | 4-8         |
| 6             | Work Sequence Diagram                                |             |

Reference ER 11-2-101, which states that budgetary information is not to be released outside the Department of the Army.

## ESTIMATED PHASE I A E & D WORK EFFORT SUMMARY

The Phase I A E & D work effort will consist primarily of the following:

- . Review the feasibility study, authorizing documents and other pertinent reports and correspondence related to the project.
- . Develop specific alternative plans to satisfy the needs of the study area.
- . Identify the economic (including cost, benefit and benefit-cost ratio), social and environmental impacts of each alternative.
- . Coordinate alternative plans with the public and mitigate controversial areas of concern.
- . Select a plan based on the assessment and evaluation of data and the results of public involvement, and, if appropriate recommend it for Congressional authorization.
- . Determine Federal and non-Federal allocation of costs.
- . Assess the capability of non-Federal interests to provide cash contributions and to satisfy other local cooperation requirements.
- . Prepare a Phase I Reformulation A E & D report including a DEIS and present the results and recommendations at a Stage 3 public meeting.
- . Coordinate the draft report and DEIS with CEQ and the public.
- . Submit the final report to OCE and BERH and release a public notice of completion of the Phase I A E & D study.

## DISCUSSION AND JUSTIFICATION OF PHASE I A E & D WORK

Developed areas along the North Nashua River and its tributaries, especially heavily developed sections of Fitchburg, are vulnerable to severe flooding. The recently completed North Nashua River channel rehabilitation project in Fitchburg provides a degree of protection, but since historic floods have equaled or exceeded the design capacity of the project, additional flood control measures are needed.

Local officials, businesses and individuals have expressed a desire for flood control improvements. Preliminary cost and benefit estimates of alternative plans indicate favorable benefit-cost ratios for several alternatives.

Concerns about improving water quality, increasing recreational opportunities, and preserving or improving fish and wildlife resources will be addressed during the study.

Detailed engineering studies, including surface and subsurface investigations, will be required to determine the optimum size and siting of alternative plans. Detailed cost and benefit analyses must be conducted to determine the cost effectiveness and cost sharing of potential improvements. Environmental studies must be accomplished and an EIS prepared in accordance with regulations enacted since authorization of the basin plan. Formal public and other meetings will be held to determine the acceptability of alternatives and to select a plan for implementation. Meetings will be held with local officials to determine their willingness and financial ability to participate in the selected plan.

The Division Engineer considers the Phase I A E & D work to be justified.



**NORTH NASHUA RIVER  
FLOOD CONTROL PROJECT  
MASSACHUSETTS**

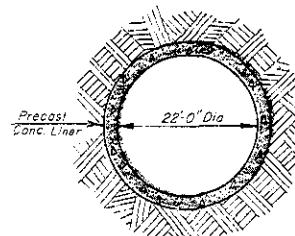
**DIVISION: NEW ENGLAND**

**BASIN: NEW ENGLAND**

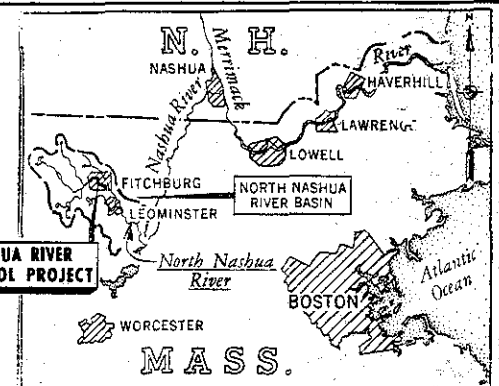
REFERENCE ER 11-2-240, WHICH STATES THAT:  
BUDGETARY INFORMATION IS NOT TO BE RELEASED  
OUTSIDE THE DEPARTMENT OF THE ARMY  
UNTIL 1 FEBRUARY 1981

# **LEGEND**

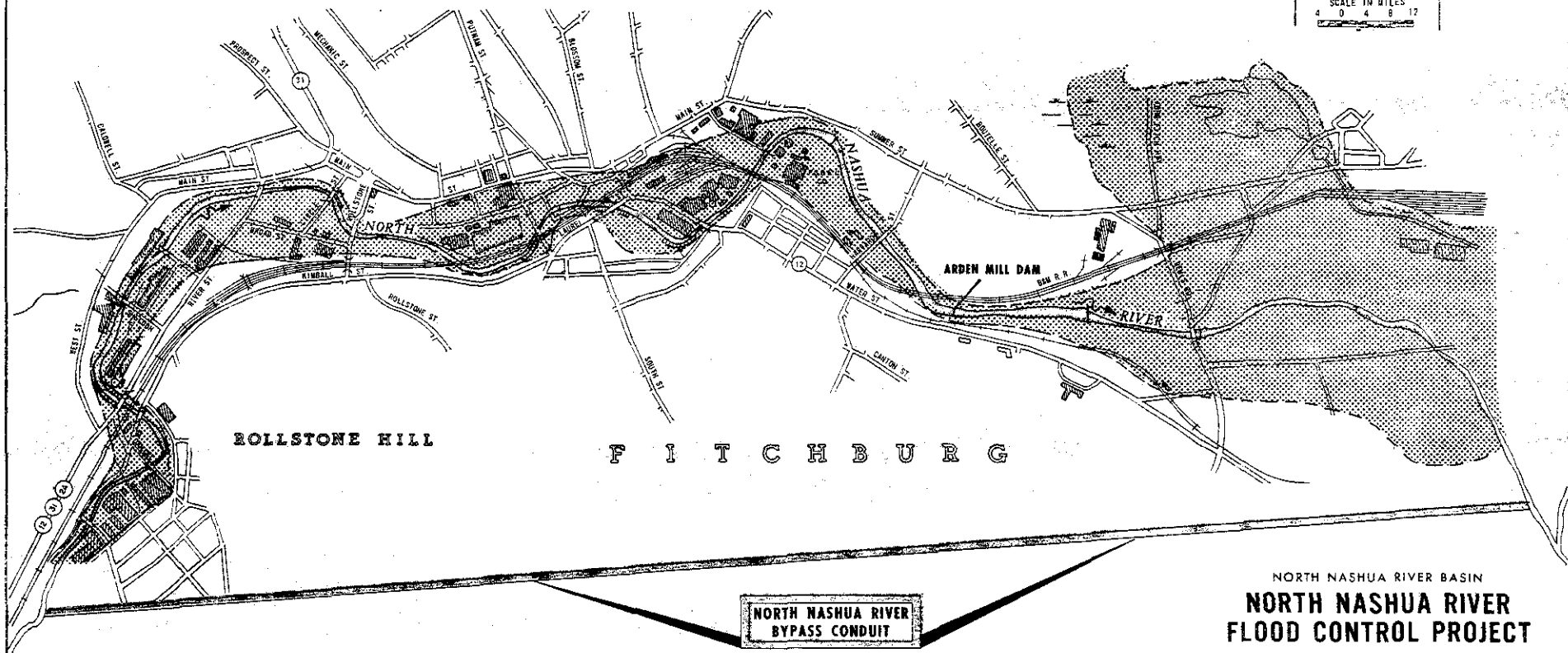
- (NONE) WORK COMPLETED AS OF 30 JUNE 1980
- (NONE) WORK PROPOSED WITH FUNDS AVAILABLE FOR FY 1981
- (NONE) WORK PROPOSED WITH FUNDS REQUESTED FOR FY 1982
-  WORK REQUIRED TO COMPLETE THE PROJECT AFTER FY 1982
-  LIMIT OF FLOODING MARCH 1936



SUPPORTED  
AUXILIARY CONDUIT  
TYPICAL SECTION - TUNNEL IN ROCK  
(NOT TO SCALE)



LOCATION MAP  
SCALE IN MILES  
4 0 4 8 12



GENERAL PLAN

SCALE: FEET  
0 500 1000

## NORTH NASHUA RIVER BASIN **NORTH NASHUA RIVER FLOOD CONTROL PROJECT** LOCAL PROTECTION

NORTH NASHUA RIVER FITCHBURG, MASS.

1 JANUARY 1981

DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
WALTHAM, MASS.

APPROPRIATION TITLE: General Investigations - Advance Engineering and Design - Local Protection (Flood Control)

PROJECT: North Nashua River Flood Control Project, Massachusetts (formerly Phillips Lake) (Continuation of Planning)

LOCATION AND DESCRIPTION: The project is located on Phillips Brook north of its confluence with the North Nashua River in Fitchburg, Worcester County, Massachusetts, about 45 miles west of Boston. Original authorization provided for construction of an earth-filled dam to impound a reservoir with flood control storage capacity of 1,600 acre-feet. However, post-authorization activities and public coordination efforts indicate that a complete reevaluation of alternatives is necessary.

AUTHORIZATION: 1966 Flood Control Act

BENEFIT TO COST RATIO: Not available. See "Other Information."

SUMMARIZED FINANCIAL DATA

|                              |               |                                     |                     |
|------------------------------|---------------|-------------------------------------|---------------------|
| Estimated Federal Cost       | Not Available | Preconstruction Planning Estimate   | \$700,000 <u>1/</u> |
| Estimated Non-Federal Cost   | Not Available | Allocations to 30 September 1980    | 150,000             |
| Total Estimated Project Cost | Not Available | Conference Allowance for FY 1981    | 150,000             |
|                              |               | Allocation for FY 1981              | 150,000             |
|                              |               | Planning Allocation for FY 1982     | 300,000             |
|                              |               | Balance to Complete Preconstruction |                     |
|                              |               | Planning After FY 1982              | 100,000             |

1/ Preconstruction planning estimate for preparation of Phase I General Design Memorandum only since complete reformulation of alternatives is necessary. See "Other Information."

JUSTIFICATION: The North Nashua River Basin has been susceptible to severe and frequent flooding. Over 2,800 acres of valley area have been subjected to heavy losses due to floods. The basin is a center of industrial and commercial areas critical to the economy of central Massachusetts. The serious consequences of any additional flooding of past magnitudes would gravely affect the economic conditions of the basin. A recurrence of the record 1936 flood under current economic conditions would cause losses estimated at \$58,900,000 in the North Nashua River Basin. The plan of protection for the North Nashua basin is needed to prevent a recurrence of these damages. In addition to the damages that would occur, a considerable segment of the Fitchburg work force would be affected.

NON-FEDERAL COSTS: Not available. See "Other Information."

STATUS OF LOCAL COOPERATION: By letter dated June 12, 1978, the President of the Fitchburg City Council noted that it and a committee of citizens appointed by the Council to advise it and the Mayor with regard to flood control on the North Nashua River support additional effort to resolve flood control problems in the North Nashua basin. In April 1980, the Fitchburg City Council voted to recommend to the Mayor that he encourage the Corps to continue study of alternative solutions to Fitchburg's flood control problems. Formal assurances of local cooperation will be requested after completion of the Phase II General Design Memorandum.

Division: New England

Region: New England  
North Nashua River, Massachusetts

COMPARISON OF FEDERAL COST ESTIMATES: The current Federal cost estimate of \$700,000 is for the preparation of the Phase I General Design Memorandum. Previous estimate was for the construction cost of Phillips Lake which is not acceptable to local interests.

STATUS OF ENVIRONMENTAL IMPACT STATEMENT AND COMPLIANCE WITH CLEAN WATER ACT: An environmental impact statement will be prepared during the General Design Memorandum phase. A final statement is scheduled to be filed with EPA in March 1983.

The provisions of Section 404 of the Clean Water Act will be met with the submission of an EIS, including a Section 404 (b)(1) Evaluation, to Congress in March 1983 and will require a subsequent appropriation or authorization action on this project by Congress.

OTHER INFORMATION: Funds to initiate preconstruction planning were appropriated in FY 1978. Due to the necessity to completely reevaluate alternatives, a Phase I is being conducted as a complete reevaluation of problems and needs in the area and a reformulation of alternative solutions to address problems and needs. Extensive public participation has been encouraged to resolve the issues being studied. The Phase I GDM portion of preconstruction planning is scheduled to be completed in October 1982.

REPORTS CONTROL SYMBOL:

| APPROPRIATION TITLE                                    |  | PROJECT   |       | DIVISION                                   |      | REGION      |       | DATE              |      |
|--|--|---|-------|--|------|-------------|-------|-------------------|------|
| Cons't General Project Planning (AE&D)                 |  | North Nashua Flood Control Project (formerly Phillips Lake), Mass |       | New England                                |      | New England |       | 1 June 1981       |      |
| APPROPRIATION CLASS Dams and Lakes (Flood Control)     |  | Project (formerly Phillips Lake), Mass                            |       | DISTRICT                                   |      | BASIN       |       | PAGE 1 OF 1 PAGES |      |
| APPROVED PROJECT ESTIMATED COST (Oct 19 1981) BASE     |  | STATUS OF FUNDS:  |       | DATE ON INITIAL CONSTR. CONTRACT           |      | N/A         |       | 19                |      |
| ESTIMATED COSTS:                                       |  | ALLOTMENTS THRU 30 SEP 19 80                                      |       | SCHEDULED PROJECT COMPLETION               |      | N/A         |       | 19                |      |
| ALL PLANNING REQUIRED TO COMPLETE GENERAL DESIGN MEMO  |  | OBLIGATIONS THRU 30 SEP 19 80                                     |       | SCHEDULED INITIATION OF                    |      | N/A         |       | 19                |      |
| ALL PLANNING REQUIRED PRIOR TO INITIATING CONSTRUCTION |  | UNOBLIGATED BALANCE 30 SEP 19 80                                  |       | RESERVOIR FILLING                          |      | N/A         |       | 19                |      |
| ALL PLANNING   |  | ALLOTMENT FOR F.Y. 19 81  |       | SCHEDULED DATE OF FIRST POWER UNIT ON LINE |      | N/A         |       | 19                |      |
|  |  | TOTAL AVAILABLE FOR F.Y. 19 81                                    |       |  |      |             |       |                   |      |
| 1  | Phase I GDM  | 620.0   |       | 27   | 9/83 |             |       |                   |      |
| 2  | EIS  | 80.0  |       | 15   | 9/83 |             |       |                   |      |
| 3  |  |   |       |  |      |             |       |                   |      |
| 4  |  |   |       |  |      |             |       |                   |      |
| 5  | 1) These costs will be developed as Phase I Reformulation studies progress.  |   |       |  |      |             |       |                   |      |
| 6  |  |   |       |  |      |             |       |                   |      |
| 7  |  |   |       |  |      |             |       |                   |      |
| 8  | 2) This cost represents the amount required for preparation of the Phase I GDM only since a complete reformulation of alternatives is necessary. |   |       |  |      |             |       |                   |      |
| 9  |  |   |       |  |      |             |       |                   |      |
| 10   |  |   |       |  |      |             |       |                   |      |
| 11   |  |   |       |  |      |             |       |                   |      |
| 12   |  |   |       |  |      |             |       |                   |      |
| 13   |  |   |       |  |      |             |       |                   |      |
| 14   |  |   |       |  |      |             |       |                   |      |
| 15   |  |   |       |  |      |             |       |                   |      |
| 16   |  |   |       |  |      |             |       |                   |      |
| 17   |  |   |       |  |      |             |       |                   |      |
| 18   |  |   |       |  |      |             |       |                   |      |
| 19   | Scheduled  | 11.0  | 37.0  | 67.0                                       | 49.0 | 68.5        | 108.0 | 73.6              | 94.9 |
| 20   | Actual   | 3.3   | 13.1  | 24.3                                       | 43.4 | 52.5        | 62.0  | 83.9              |      |
| 21   | Deviation  | -7.7  | -23.9 | -42.7                                      | -5.6 | -16.0       | -46.0 | +10.3             |      |
| 22   |  |   |       |  |      |             |       |                   |      |
| 23   |  |   |       |  |      |             |       |                   |      |
| 24   |  |   |       |  |      |             |       |                   |      |
| 25   |  |   |       |  |      |             |       |                   |      |
| 26   |  |   |       |  |      |             |       |                   |      |
| 27   |  |   |       |  |      |             |       |                   |      |
| 28   |  |   |       |  |      |             |       |                   |      |
| 29   |  |   |       |  |      |             |       |                   |      |
| 30   |  |   |       |  |      |             |       |                   |      |
| 31   |  |   |       |  |      |             |       |                   |      |
| 32   |  |   |       |  |      |             |       |                   |      |
| 33   |  |   |       |  |      |             |       |                   |      |
| 34   |  |   |       |  |      |             |       |                   |      |

PLANNING SCHEDULE (PB-2b)  
 (IN THOUSANDS OF DOLLARS)

Budget FY-1982  
 Unobligated Balance 0  
 Allotment Required 300.0  
 Balance Req'd to Complete  
 FY 1983 FY 1984 FY 1985  
 100.0

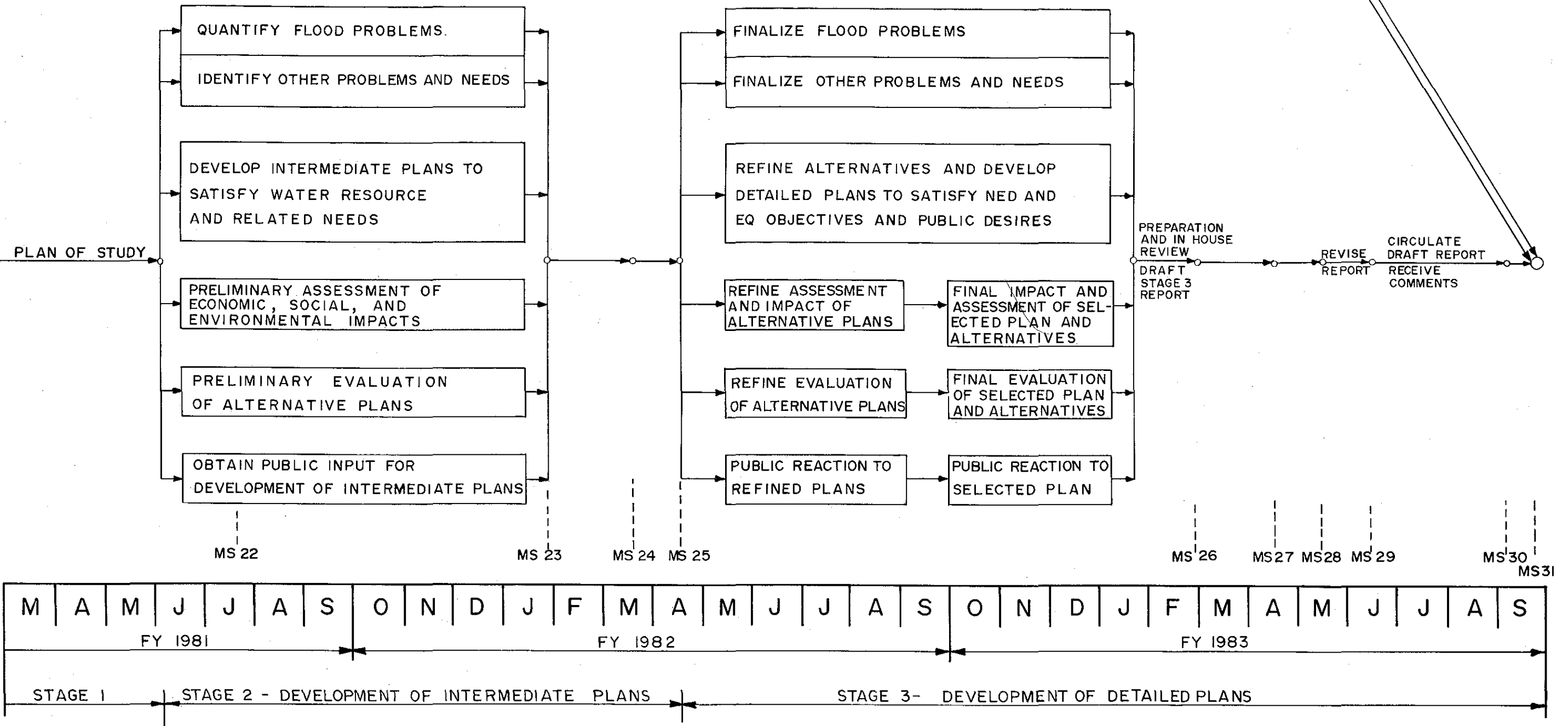
Exhibit 4  
 4-7

STUDY SCHEDULE MILESTONES

| <u>Milestone<br/>Number</u>             |  | <u>Date<br/>Scheduled</u> | <u>Date<br/>Completed</u> |
|---|--|---------------------------|---------------------------|
| <u>Stage 1 Planning</u>                 |  |                           |                           |
| 21                                      | Phase I Study Initiation   |                           | (11-78)                   |
| 22                                      | Approval of Plan of<br>Study   | 07 -81                    |                           |
| <u>Stage 2 Planning (Reformulation)</u> |  |                           |                           |
| 23                                      | Submission of Stage 2<br>Documentation to OCE  | 01-82                     |                           |
| 24                                      | Stage 2 Checkpoint Conference  | 03-82                     |                           |
| 25                                      | Completion of Action on<br>Conference MFR  | 04-82                     |                           |
| <u>Stage 3 Planning</u>                 |  |                           |                           |
| 26                                      | Submission of Draft Phase I<br>GDM and EIS to OCE                                      | 02-83                     |                           |
| 27                                      | Stage 3 Checkpoint Conference  | 04-83                     |                           |
| 28                                      | Completion of Action on<br>Conference MFR  | 05-83                     |                           |
| 29                                      | Coordination of Draft<br>Phase I GDM and EIS   | 06-83                     |                           |
| 30                                      | Submission of Final Phase I<br>GDM and EIS to OCE                                      | 09-83                     |                           |
| 31                                      | Release of Division Engineer's<br>Public Notice & Submission of<br>Phase I GDM to BERH | 09-83                     |                           |

# STUDY MANAGEMENT

## PUBLIC INVOLVEMENT



NORTH NASHUA RIVER  
FLOOD CONTROL PROJECT  
(FORMERLY PHILLIPS BROOK)  
INCLOSURE 4  
EXHIBIT 6